

What is claimed is:

1. A separator comprising a flexible nonwoven having a porous inorganic coating on and in said nonwoven, the material of said nonwoven being selected from non-woven nonelectroconductive polymeric fibers, characterized by said nonwoven having a thickness of less than 30 μm , a porosity of more than 50% and a pore radius distribution in which at least 50% of the pores have a pore radius from 75 to 150 μm .
2. The separator of claim 1, characterized by said separator being less than 35 μm in thickness.
3. The separator of claim 1 or 2, characterized by said polymeric fibers being selected from fibers of polyacrylonitrile, polyester and/or polyolefin.
4. The separator of at least one of claims 1 to 3, characterized by said polymeric fibers being from 0.1 to 10 μm in diameter.
5. The separator of at least one of claims 1 to 4, characterized by said flexible nonwoven having a base weight of less than 20 g/m^2 .
6. The separator of at least one of claims 1 to 5, characterized by said nonwoven being from 5 to 30 μm in thickness.
7. The separator of any of claims 1 to 6, characterized by said porous inorganic coating present on and in said nonwoven comprising oxide particles of the elements Al, Si and/or Zr having an average particle size from 0.5 to 7 μm .

8. The separator of any of claims 1 to 7, characterized by said porous inorganic coating present on and in said nonwoven comprising aluminum oxide particles having an average particle size from 1 to 4 μm which are adhered by an oxide of the elements Zr or Si.
9. The separator of at least one of claims 1 to 8, characterized by said separator being from 30 to 80% in porosity.
10. The separator of at least one of claims 1 to 9, characterized by said separator having a breaking strength of more than 1 N/cm.
11. The separator of at least one of claims 1 to 10, characterized by said separator being bendable around a radius down to 100 mm without damage.
12. The separator of at least one of claims 1 to 11, characterized by said separator being bendable around a radius down to 1 mm without damage.
13. A process for producing a separator as claimed in at least one of claims 1 to 12, which comprises providing a flexible nonwoven which has a thickness of less than 30 μm , a porosity of more than 50% and a pore radius distribution in which 50% of the pores have a pore radius from 75 to 150 μm with a porous inorganic coating on and in said flexible nonwoven by applying to said nonwoven a suspension comprising oxide particles and at least one sol and heating one or more times to solidify said suspension on and in said nonwoven, the material of said nonwoven being selected from non-woven nonelectroconductive polymeric fibers.

14. The process of claim 13, wherein said suspension comprises oxide particles having an average particle diameter from 0.5 to 7 μm of the elements Al, Zr and/or Si and at least one sol.
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15. The process of claim 13 or 14, wherein said suspension is brought onto and into said substrate by printing on, pressing on, pressing in, rolling on, knife-coating on, spread-coating on, dipping, spraying or pouring on.
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16. The process of at least one of claims 13 to 15, wherein said polymeric fibers are selected from the fibers of polyacrylonitrile, polyester or polyolefin.
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17. The process of at least one of claims 13 to 16, wherein said suspension comprises at least one sol of the elements Al, Zr and/or Si and is prepared by suspending oxide particles in at least one of these sols.
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18. The process of claim 17, wherein said sols are obtained by hydrolyzing at least one compound of the elements Al, Zr and/or Si with water or an acid or a combination thereof.
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19. The process of claim 18, wherein said hydrolyzing is effected on at least one alkoxide compound of the elements Zr, Al and/or Si or at least one nitrate, carbonate or halide selected from the compounds of the elements Zr, Al and/or Si.
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20. The process of at least one of claims 13 to 19, wherein said metal oxide particles are aluminum oxide particles having an average particle size from 0.5 to 7 μm .
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21. The process of at least one of claims 17 to 20, wherein the mass fraction of said suspended metal oxide particles is from 1 to 10 times that of the sol used.
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22. The process of at least one of claims 13 to 21, wherein said suspension present on and in said nonwoven is solidified by heating to 50-350°C.
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23. The process of claim 22, wherein said heating is effected at from 110 to 280°C for from 0.5 to 10 minutes.
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24. The use of a separator as claimed in at least one of claims 1 to 12 as a separator in lithium batteries.
25. A battery comprising a separator as claimed in at least one of claims 1 to 12.